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Algorithm for Using Codes In Place Of Facial Images during Image Processing In Large Databases and Data Warehouses to Reduce Storage, Enhance Efficiency and Processing Speed

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Abstract: - The main purpose of this work is to assign codes to the facial image stored in large databases / Data warehouses, the images require large amount of storage as compared to a numeric code. Moreover, when images are compared to images, the process is more time consuming as compared to the numeric codes. It is proposed to keep up all images in a separate database file along with their codes. The codes of facial images may be stored in master Database/ Data warehouse for all records. The search queries can be processed using the numeric codes. In this manner the Time Complexity and Space Complexity are reduced considerably. Whenever, any image is received for searching its record, first its code is obtained by proposed algorithm and then this code is used to search the record from database/Data Warehouse making entire procedure faster and efficient.

Keywords: - *Image processing, coding, facial images, Numeric Codes, Database / Data Warehouse*

1. INTRODUCTION

There exist several techniques to analyze and synthesize the human facial images. The facial images are analyzed using various poses, especially the front or side poses. The oblique left or oblique right facial images require more rigorous computing. It is usual practice to store the front pose of facial images in Databases/Data Warehouses keeping in view the posture and position of eyes pair, chin and nose in

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such a way that right and left side of

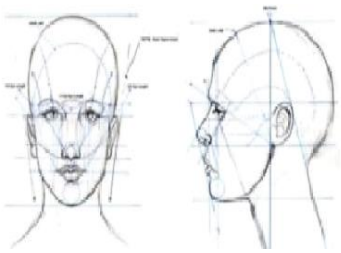

Figure 1: Face Features

the face is symmetrically visible and covered up in the image.

Proposed & devised an efficient algorithm for Coding Person's Names in large Databases/ Data warehouses to enhance Processing speed, Efficiency and to reduce Storage Requirements. [1] Allocates numeric codes to Names (First name, Middle name, Last name) using three numeric characters for each instead of 40 Alpha-Characters, which are normally reserved for one complete name. A similar approach shall be employed for facial image coding in this paper. The philosophy of [1] is applied to images in this paper to reduce Time Complexity and Space Complexity. [2] Describes a method to assign codes i.e. Unique ID for face recognition using openCV from open source. It allocates code in the situation, for example, when person is waiting in front of camera for several exposures and the algorithm allocates codes to each pose.[3] Describes uses and procedures of OpenCV. It provides built in Library functions for real time image processing. The imgproc module provides basic and important image processing Techniques/Algorithms for filtering, image transformations and conversions.

Voila Jones Algorithm is discussed in [4], which identifies and detects various parts of the facial image, the eyes, nose and mouth using common characteristics of the face. [2] Claims that 99% accuracy in image processing can be achieved in front-pose face image. However, the accuracy is considerably reduced with glasses, oblique face position and changed hairstyle, increasing or decreasing light illumination. For unique images most important factors are depth of jaws, distance between eyes, nose width and length of cheekbones for changing image into digital code. Different patterns to code the finger prints have been presented in [5] in order to use these codes in the software for storage and retrieval of criminal information.

Various issues regarding facial patterns and physical appearance have been elaborated in [6]. For facial image processing and coding, we are interested in the front pose face pattern only. The front pose facial image from [7] also provides the points for measurement of distances as shown below:

Moreover, the points of measurement of various distances are illustrated from the following figure [5]:

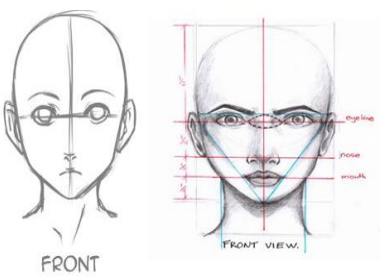

Figure 2: Points of Measurement of Various Distances

The following images [7] also clarify the points of measurements of distances:

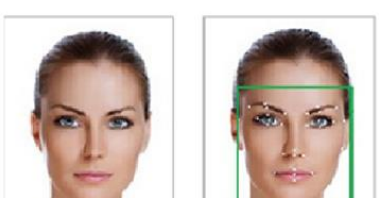

Figure 3: Points of Measurement (Depicted as Points

Definition: **Elastic Bunch Graph Matching (EBGM)** [8]**:** This algorithm is used in computer vision to recognize the objects of an image on a graph representation derived from other images. The Elastic Bunch Graph Matching returns the similarity value, the positions of the nodes in image, which helps in creating an image graph.

Definition: **Gabor Filters** [9] are used in image processing with Gaussian envelop function for texture analysis. We can express profile of simple cell using a 2-D Gabor function.

Definition: **Biometrics:**

This technology is extensively and commonly used in forensic to analyze for measurement and examine the characteristics of humans like DNA, irises, and voices and face images. The related information can be converted into digital form, encrypted and stored in a database. The algorithm can translate the given image into a

digital code.

It is remarkable that God has created humans with different physical appearances, unique DNA, finger prints and iris, which do not change. Moreover, all these characteristics

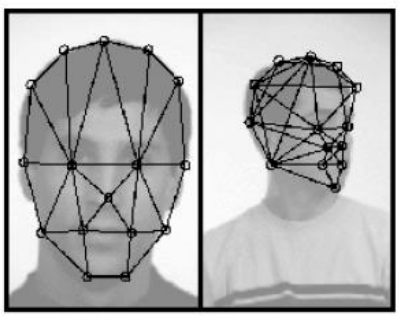

Figure 4 Grids for Face Finding

can be measured.

Applications of Biometrics:

There are several biometric systems designed to identify humans by matching the characteristics from the database or Data warehouse. The employee's roll call system is one such example, others in daily life are computer login, internet access, ATM forensic applications such as used in Criminal Information system elaborated and designed in [5][6]. The Face Recognition by Elastic Bunch Graph Matching has been discussed in [10].

2. METHODOLOGY

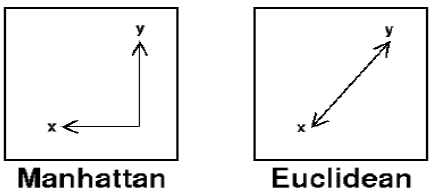

Figure 5: Representation of Manhattan and Euclidean Distances

A grid of points is launched as

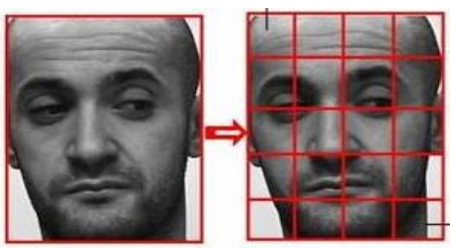

Figure 6: Division of Face Image into Blocks

shown, then a bunch graph is constructed for recognition, it works with Instructions on getting FERET database. The purpose of FERET is to design automatic Face Recognition System. For Enhanced Security of Digital Images [12][13] can be used developed by the second author of this paper,

Assigning code to facial image:

There are eighty nodal points (or end points) on human face by means of which the digital code called face

print can be generated by biometric software as shown above. The distance between relevant points is computed for code generation. The assumptions for Algorithm such as given below:

- Front view of the image
- Image is captured from fixed distance from the camera

In fact, the pixels values of points on the face, (xi, yi) are used to generate a unique 14 digits code, which is to be used as a key in database instead of image to speed up the process.

$$d_E(x,y) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2}$$

$$= \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}$$

Euclidean Distance Formula:

Example:

```
// calculate distance between lefteye center and right eye center double distanceBetweenEyes = math.sqrt(((facialFeatures[1].y - facialFeatures[0].y)^2) + ((facialFeatures[1].x - facialFeatures[0].x)^2));

// calculate distance between Left eye center (LEC) and nose tip (NT)

Double distanceBetweenLECNT = Math.Sqrt(((facialFeatures[2].y –

facialFeatures[0].y) ^ 2) +

((facialFeatures[2].x - facialFeatures[0].x) ^ 2));
```

3. RESULTS & DISCUSSION

Prior to code generation, the operations to be performed by the algorithm on the face image are binarization, thinning, lighting and edge detection. The Algorithm is very useful for large Databases and Data warehouses. The Algorithm will reduce the Time Complexity and Space Complexity. The RDMS Oracle is most suitable for testing and searching.

Procedure for Facial Images:

- Image is uploaded imported from database.
- The user may also prompt or upload image.
- Apply EBGM (Elastic Bunch Graph Matching) and 3-D algorithm.

- EBGM will be applied in conjunction with a 3-D matching algorithm, in which faces are represented as graphs.
- Conversion into numeric code.
- Another algorithm is used to convert resultant image into a 14 digit code. This code will then be used for searching.
- In external requirement, Camera will be interfaced with computer system.

4. Graphical User Interface:

The Graphic User Interface contains personal information about the person whose image is being processed, such as First Name, Middle Names, Last name, gender, occupation, Date of Birth and the Image itself. There is also provision for the 14 Digit code returned by the Algorithm. In order to facilitate the design, we define the following terms:

Definition of thinning: The thinning operation is useful for eliminating foreground pixels from the imported binary image. It is suited for skeletonization.

Definition of Skeletonization: It is shape obtained and derived by morphological operators in image processing.

Definition of Binarization: The binarization is conversion of an image into binary image, where, a pixel is allocated either black or white; the image then has foreground color and remaining portion is allocated background color.

5. PSEUDO CODE FOR THE DATA FLOW

STEP 1: Scan from camera or import image from the database

STEP 2: Apply pre-process for matching code

STEP 3: Generate image code send it to GUI

STEP 4: store the code in a specified column of

5.1. Major Points for Design

The major points in design are scan image or import-image, enhancement and resizing of image and then thinning is applied. The

procedure like indexing the database is followed by matching. The enhanced image is obtained for feature detection. After matching procedure, the image code is prepared and sent to GUI as well as database. With courtesy, the following design is modified form of [12] originally prepared for scanning and processing images such as fingerprints etc. as shown in figure 8.

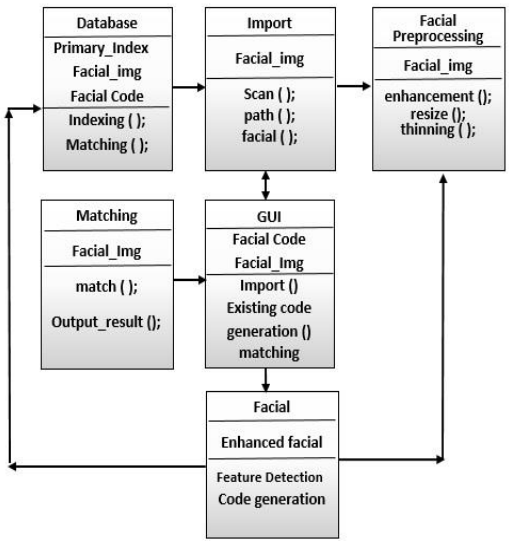

Figure 7: Data Flow Diagram

6. CONCLUSION

The Algorithm will reduce the Time Complexity and Space Complexity. The RDMS Oracle is most suitable for Testing and searching. The Scheme can be applied to 3D face recognition and for regenerating damaged images.

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